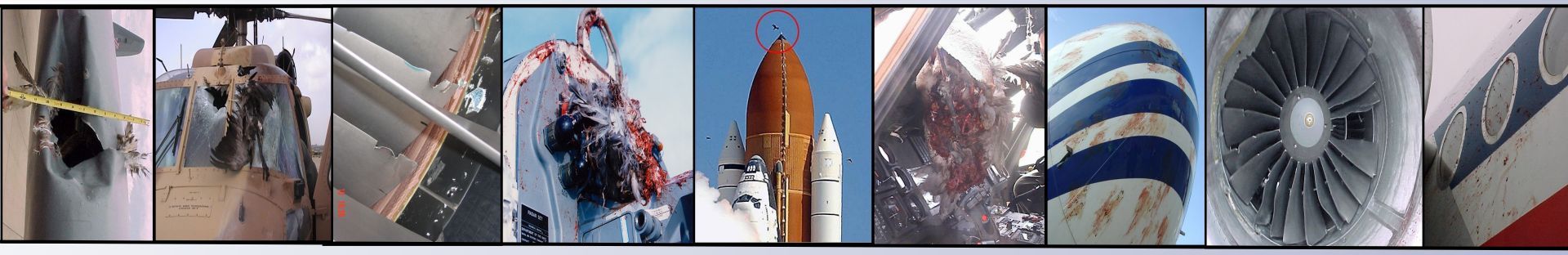


The Birdstrike Identification Program at The Smithsonian Institution

Carla J. Dove, Ph.D.
Division of Birds, National Museum of Natural History
Washington, DC

AIR FORCE SAFETY CENTER

Smithsonian

Charting the Next Century of Flight
FEDERAL AVIATION ADMINISTRATION

“BIRDSTRIKE IDENTIFICATION”

Each year bird-aircraft collisions (birdstrikes) cause an average of $44 M in damages to US Air Force, and $600 M in damages to US civil aircraft.

T-38 – *White-tailed Hawk*

American Airlines – *Canada Goose*

Experimental Aircraft – *Lesser Scaup*

T-38 – *Great Egret*

Top USAF Birdstrikes Strikes by Cost

Current as of 1 Jan 2007

Common Name	Cost	Count	Cost per 100K Flying Hours
American White Pelican	$257,628,460.00	18	$444,527.78
Canada Goose	$92,328,526.00	129	$159,309.24
Black Vulture	$54,355,588.00	403	$93,788.43
Turkey Vulture	$51,708,040.00	776	$89,220.19
Spot-billed Duck	$24,920,198.00	13	$42,998.82
Red-tailed Hawk	$13,353,102.00	781	$23,354,.29
Barn Swallow/Swallow	$11,272,852.00	1745	$19,450.86
Dark-eyed Junco	$10,043,181.00	100	$17,329,11
American Mourning Dove	$9,520,849.00	2497	$16,427.85
Snow Goose	$6,317,841.00	73	$86,545.77
Horned Lark	$5,760,469.00	2989	$9,939.49

Data span 1985-2007

2007 How Much Damage Can A Bird Cause? 2007

$7,176/strike ($7,176/1)

$547/strike


Red-tailed Hawk, note dark "patagial" mark of leading edge.
Photo - WS Clark - U.S.G.S.

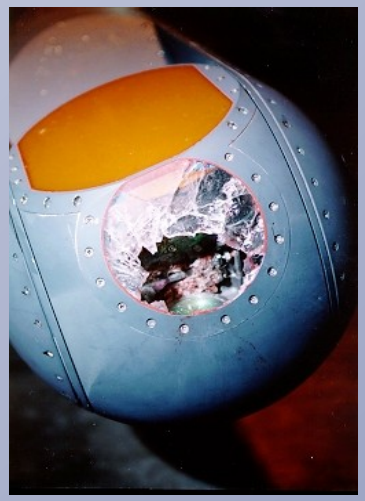
$32,258/strike ($1M/31)

$2,042/strike
($335,000/164)

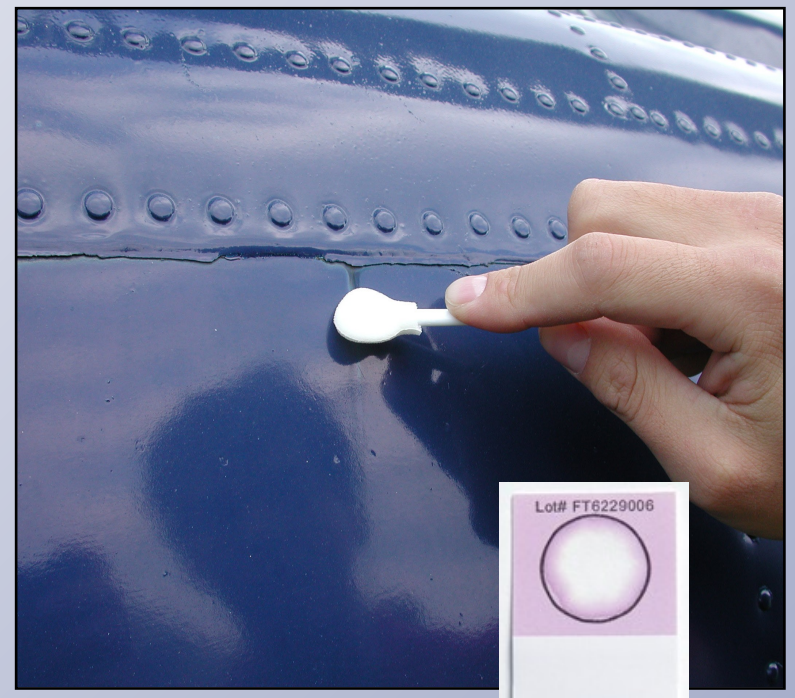
Benefits of species identification data:

- Development of bird-resistant aircraft windshields and engines based on weights of birds

- USAF F-16 cockpit redesigned to lower pilot's seating position to avoid injury from break-away debris
- Data used for USAF BAM (Bird Avoidance Model)
- Data used to justify construction of landfills away from airfields



- Habitat management plans implemented to discourage bird use on airfields
- Pest Management/bird control on airfields
- USFWS depredation permits
- Information on migration, habitat preference, diet, life history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FEATHER IDENTIFICATION – Whole Feathers

50% OF THE BIRDSRIKE SAMPLES ARE IDENTIFIED USING CHARACTERISTICS OF WHOLE FEATHERS

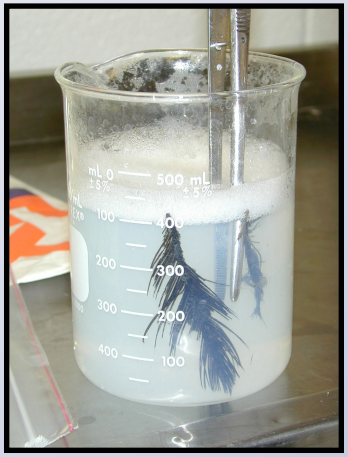
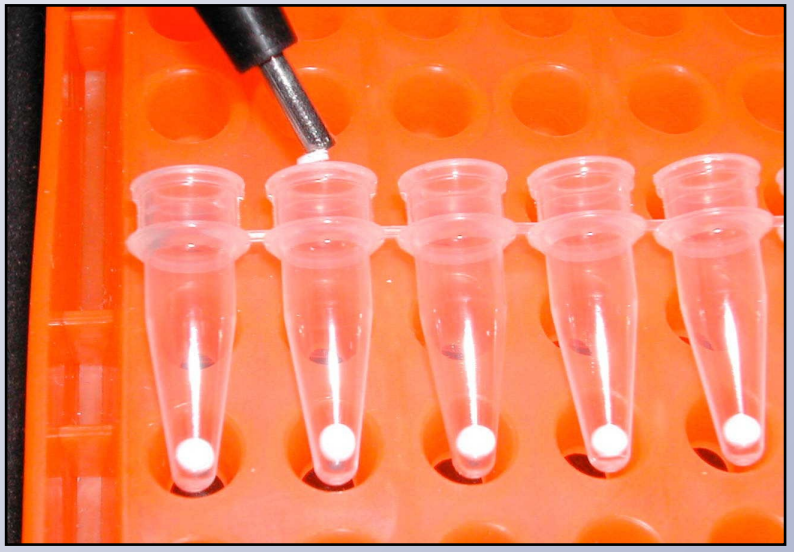
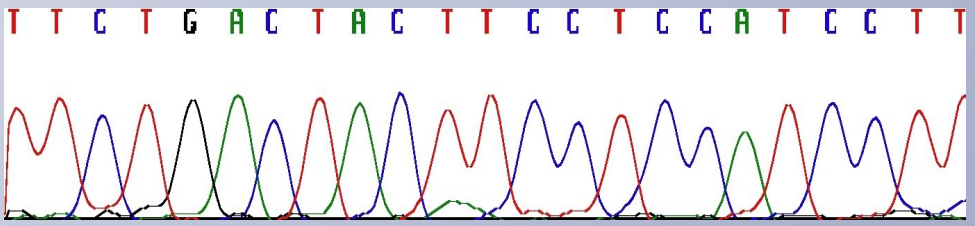
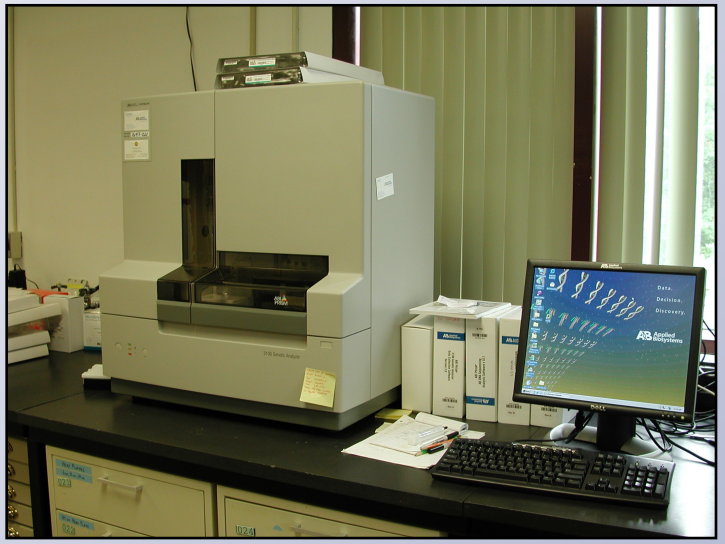


Photo: Chip Clark

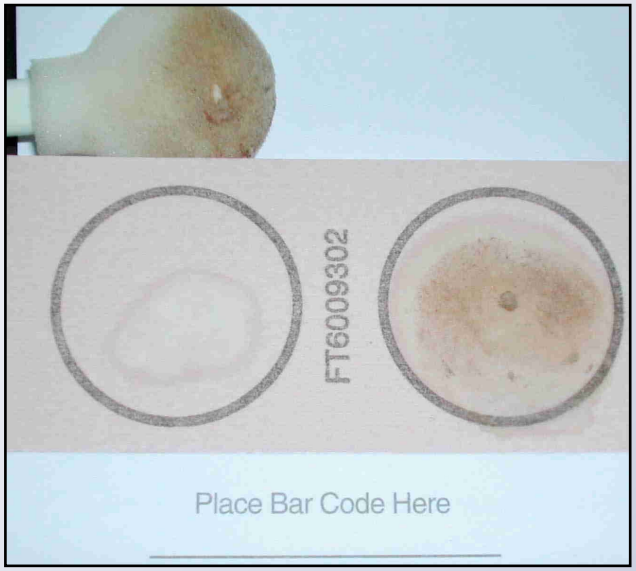
FEATHER IDENTIFICATION –DNA Analysis








Smithsonian Institution - Feather Identification Lab
Bird Strike
DNA Kit
Bird Strike - DNA sample collection information/checklist
All-Weather
Student Journal
FTA®
Mini Card
Whatman® BioScience
Fisherbrand
FEATHER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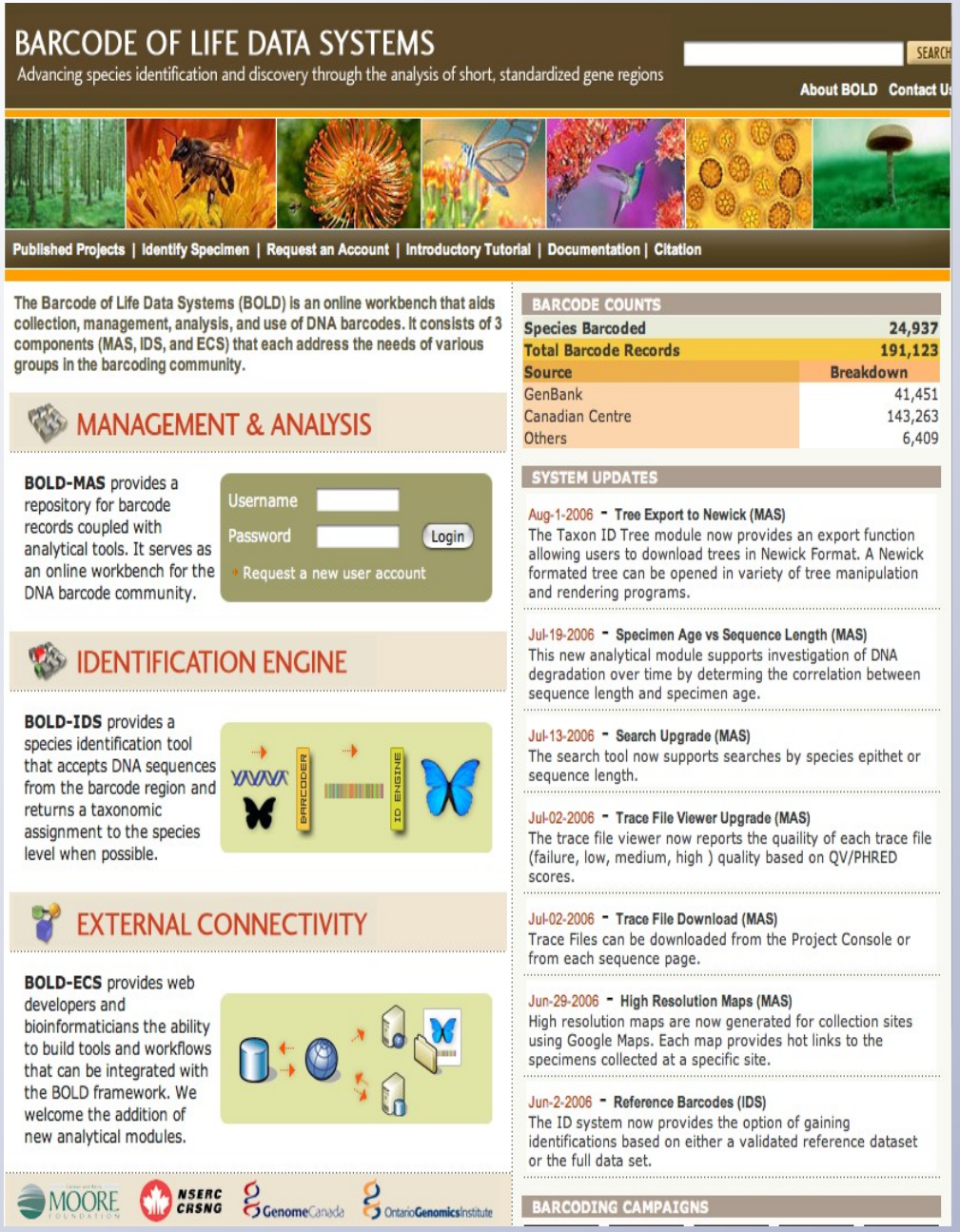


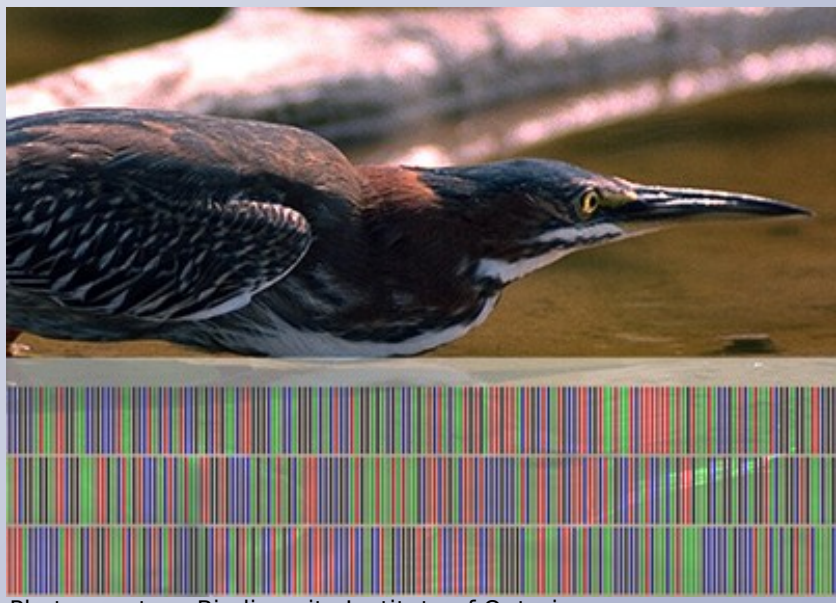
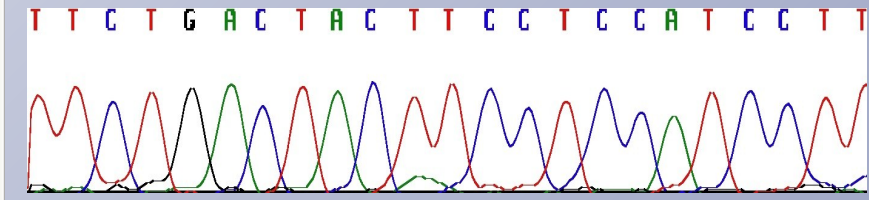


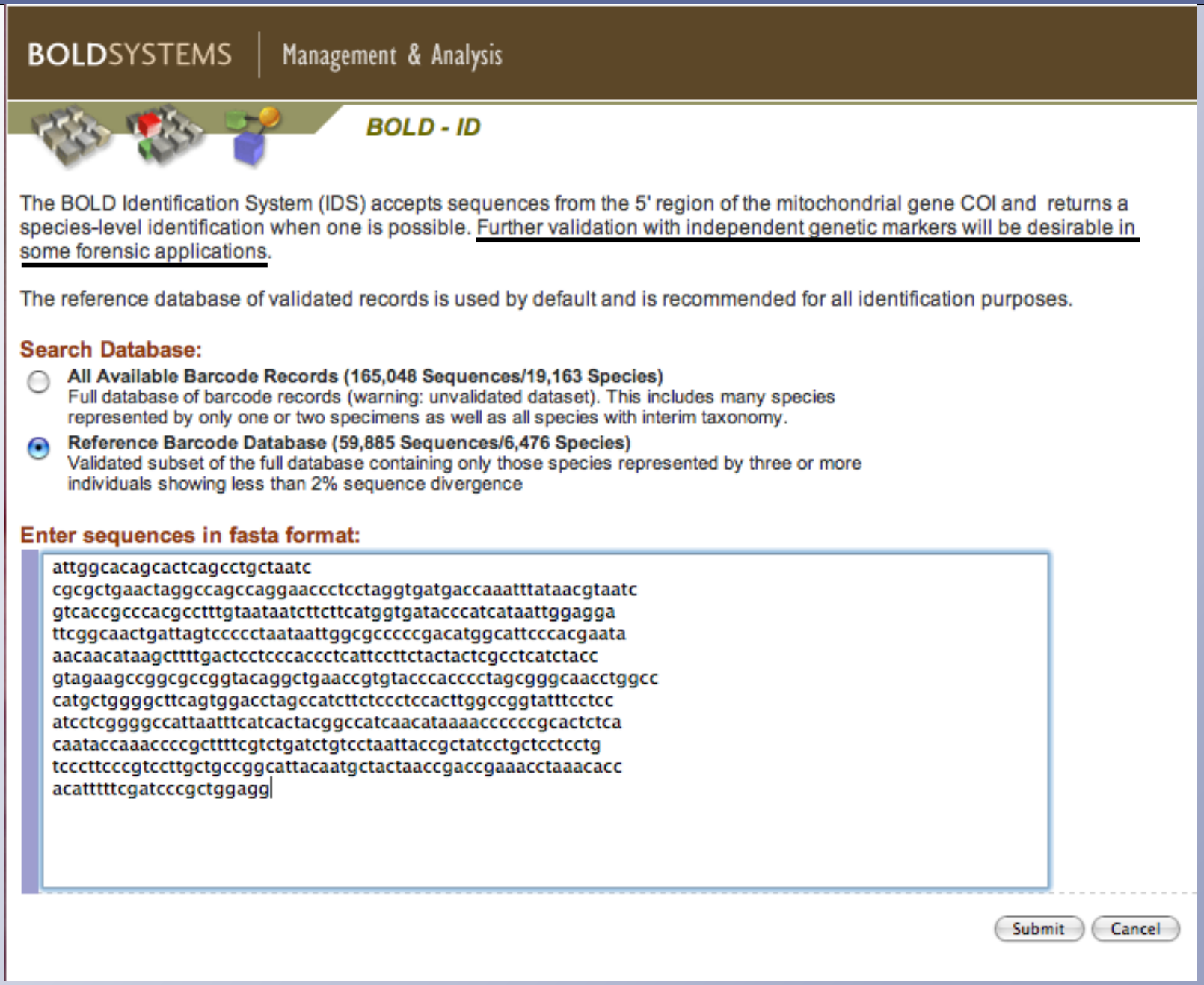
Photo courtesy Biodiversity Institute of Ontario



A DNA “barcode” is a 648 bp portion of a gene called cytochrome c oxidase subunit 1 (CO1) that has been selected as a standardized region for species identification

Smithsonian

UNIVERSITY of GUELPH



Barcode of Life Database (BoLD)

BOLDSYSTEMS | Management & Analysis

PRINT

Specimen Identification Request

Search Request:

Type : Reference Database Search

Search Result:

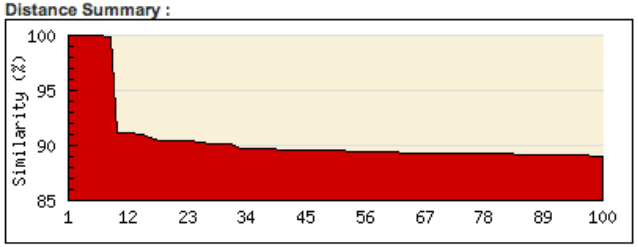
Identification Summary :

Taxonomic Level	Taxon Assignment	Probability of Placement (%)
Phylum	Chordata	100
Class	Aves	100
Order	Anseriformes	100
Family	Anatidae	100
Genus	*Aix*	100
Species	*Aix sponsa*	100

A species level match has been made. This identification is solid unless there is a very closely allied congeneric species that has not yet been analyzed. Such cases are rare.

Tree Based Identification | Species Page

Distance Summary :



Similarity scores of the top 100 matches

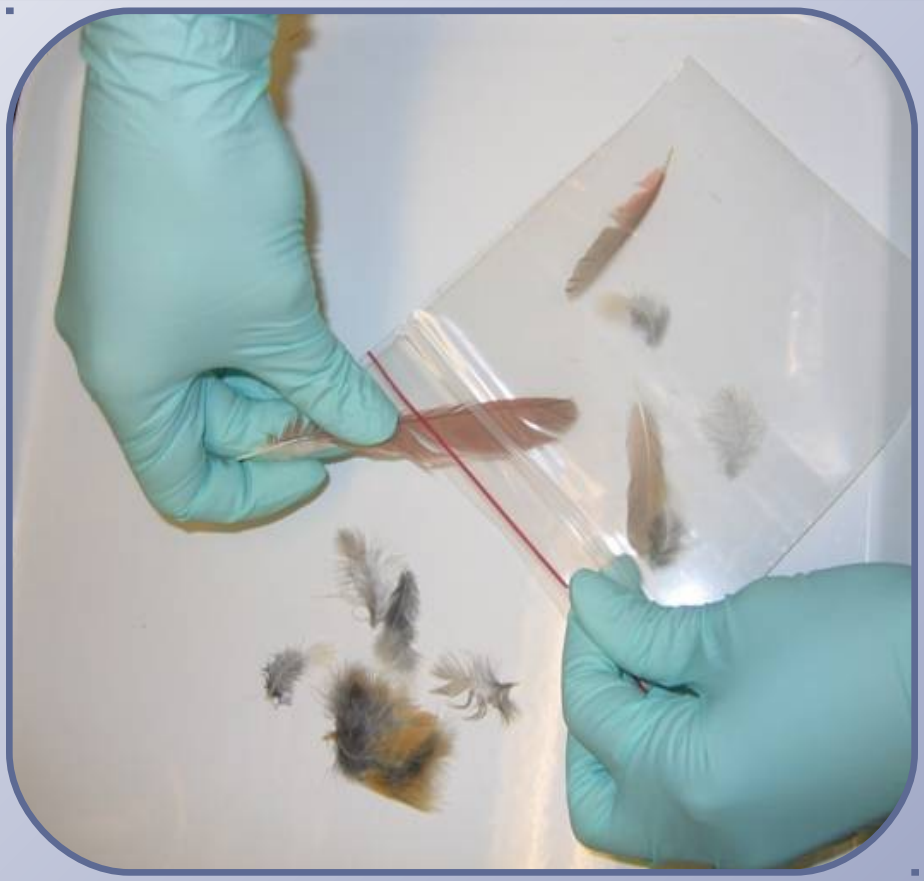
TOP 20 Matches :

Display option: default

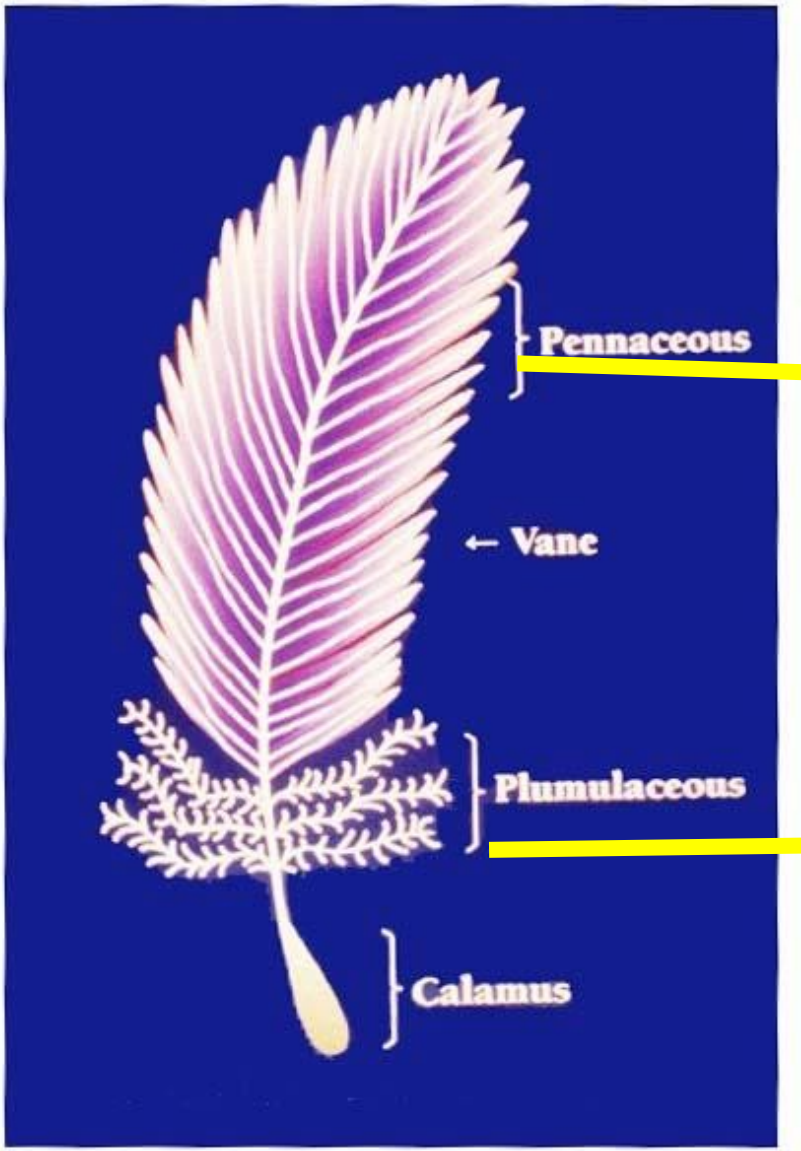
Phylum	Class	Order	Family	Genus	Species	Specimen Similarity (%)
Chordata	Aves	Anseriformes	Anatidae	Aix	*sponsa*	100
Chordata	Aves	Anseriformes	Anatidae	Aix	*sponsa*	100
Chordata	Aves	Anseriformes	Anatidae	Aix	*sponsa*	100
Chordata	Aves	Anseriformes	Anatidae	Aix	*sponsa*	100
Chordata	Aves	Anseriformes	Anatidae	Aix	*sponsa*	100
Chordata	Aves	Anseriformes	Anatidae	Aix	*sponsa*	100
Chordata	Aves	Anseriformes	Anatidae	Aix	*sponsa*	100
Chordata	Aves	Anseriformes	Anatidae	Aix	*sponsa*	99.83
Chordata	Aves	Anseriformes	Anatidae	Aix	*sponsa*	99.83
Chordata	Aves	Anseriformes	Anatidae	Melanitta	*nigra*	91.16
Chordata	Aves	Anseriformes	Anatidae	Melanitta	*nigra*	91.16
Chordata	Aves	Anseriformes	Anatidae	Melanitta	*nigra*	91.16
Chordata	Aves	Anseriformes	Anatidae	Melanitta	*nigra*	91.13
Chordata	Aves	Anseriformes	Anatidae	Melanitta	*nigra*	91.07
Chordata	Aves	Anseriformes	Anatidae	Melanitta	*nigra*	90.98
Chordata	Aves	Anseriformes	Anatidae	Melanitta	*nigra*	90.77
Chordata	Aves	Anseriformes	Anatidae	Bucephala	*islandica*	90.58
Chordata	Aves	Anseriformes	Anatidae	Bucephala	*islandica*	90.4
Chordata	Aves	Anseriformes	Anatidae	Bucephala	*islandica*	90.4
Chordata	Aves	Anseriformes	Anatidae	Bucephala	*islandica*	90.4

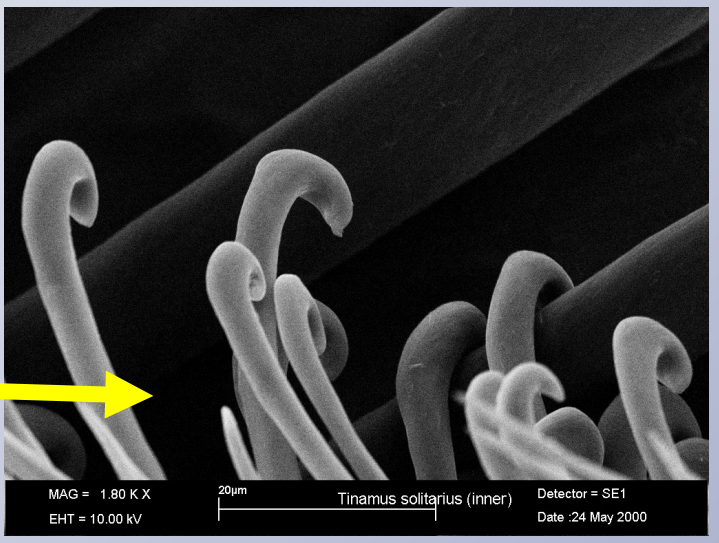
100% match to Wood Duck (*Aix sponsa*)

FEATHER IDENTIFICATION –Microscopic Analysis

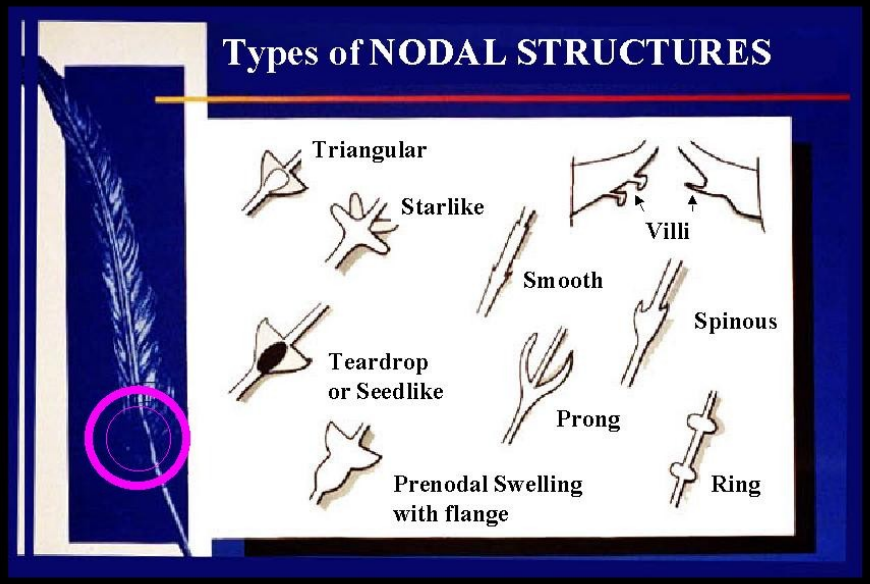


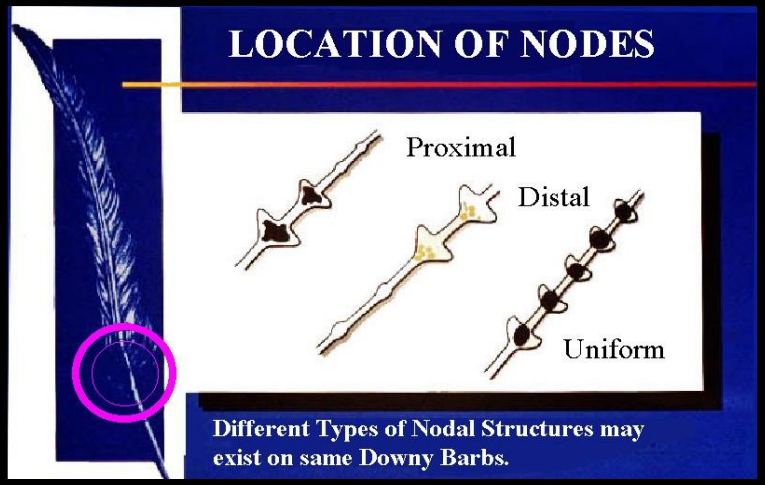
FEATHER IDENTIFICATION –Microscopic Analysis

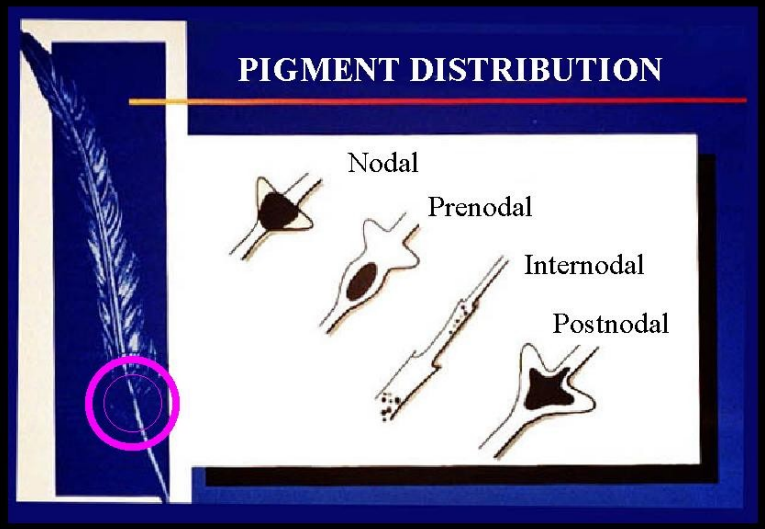




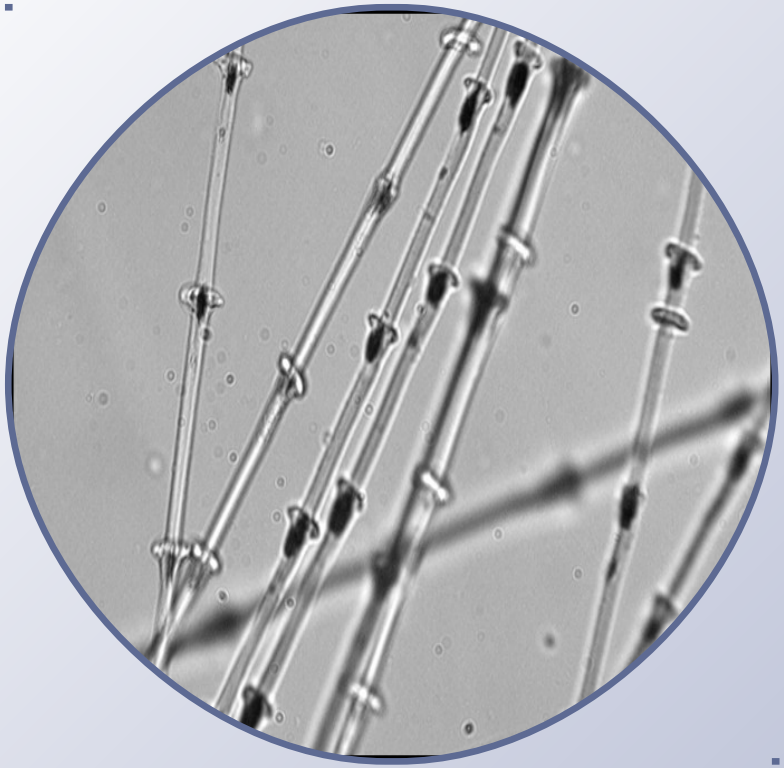
FEATHER IDENTIFICATION –Microscopic Analysis

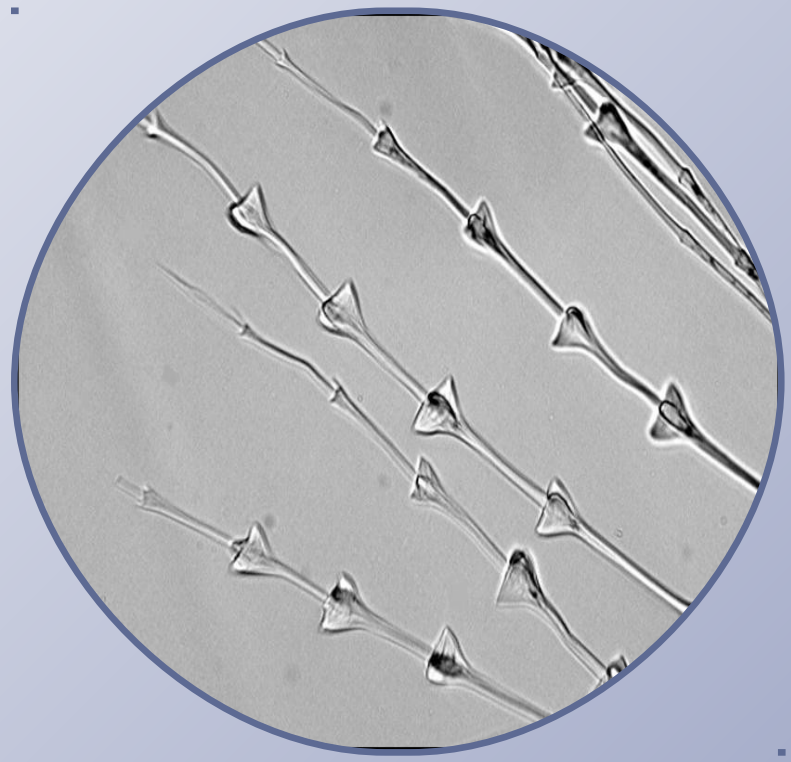






FEATHER IDENTIFICATION –Microscopic Analysis





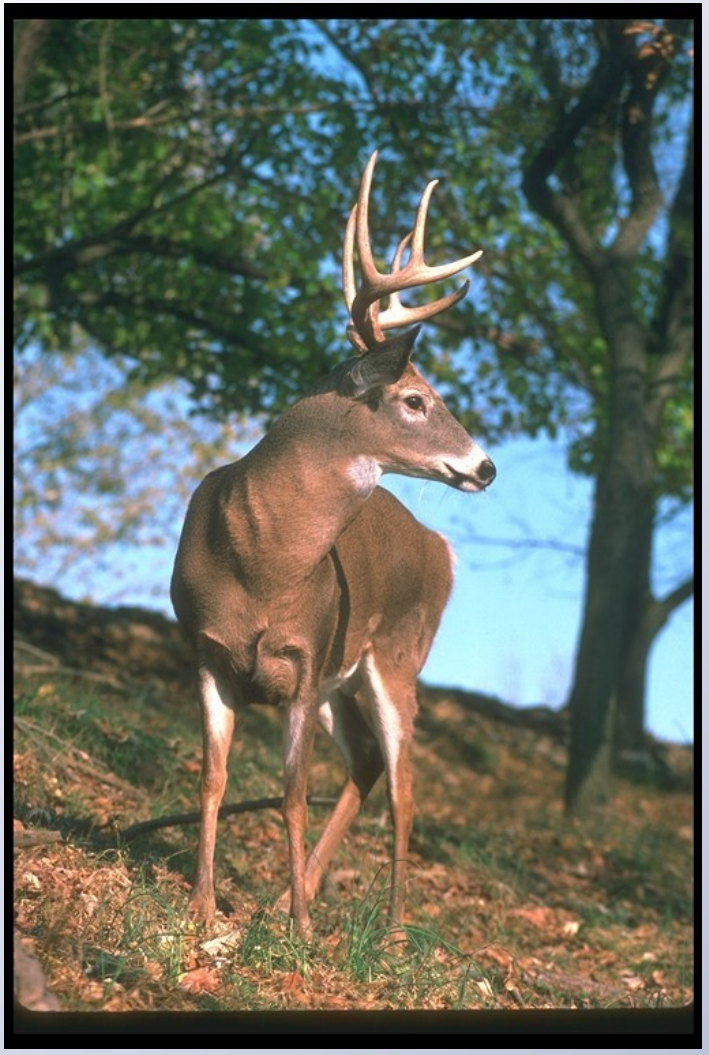
FEATHER IDENTIFICATION TOOLBOX

Birdstrike Sample

Feathers ↔ ‘Snarge’

DNA Lab

Species Identification

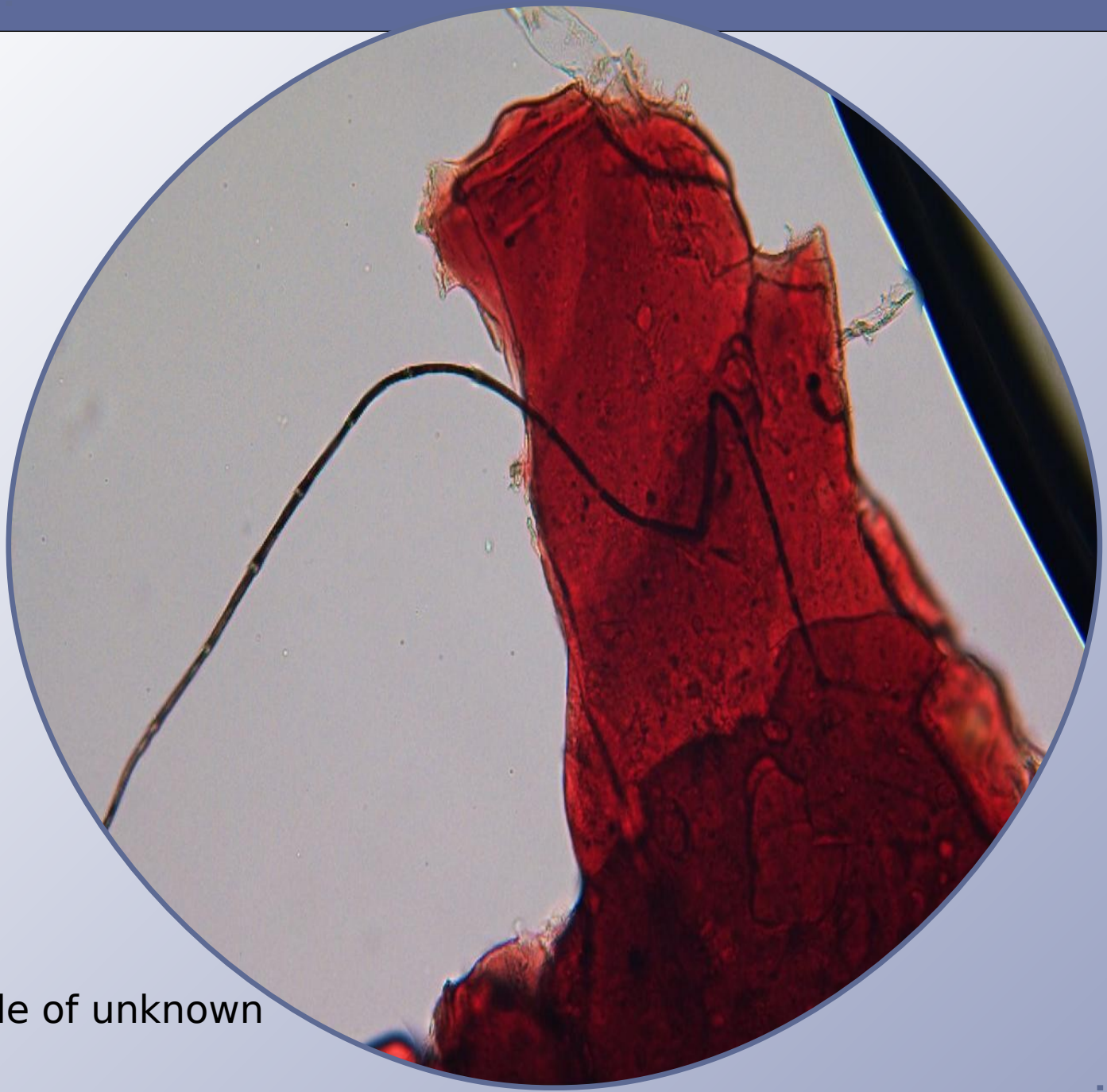


14 January 2008, Randolph AFB

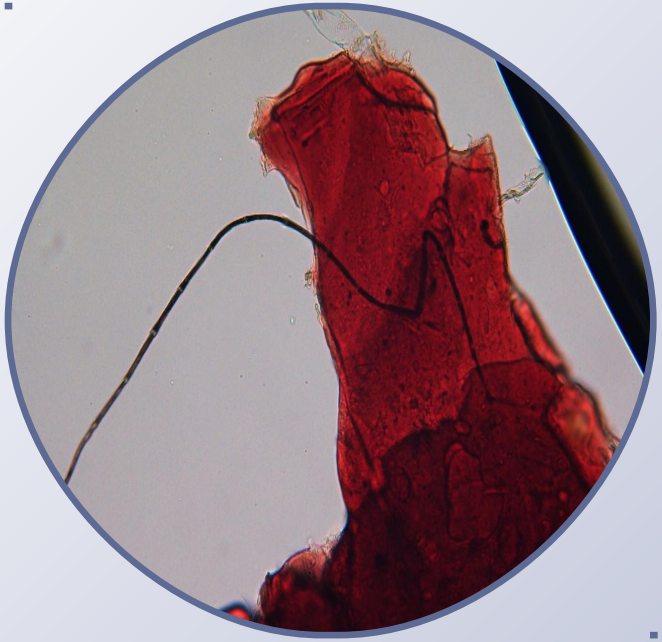
Damage = $8,000

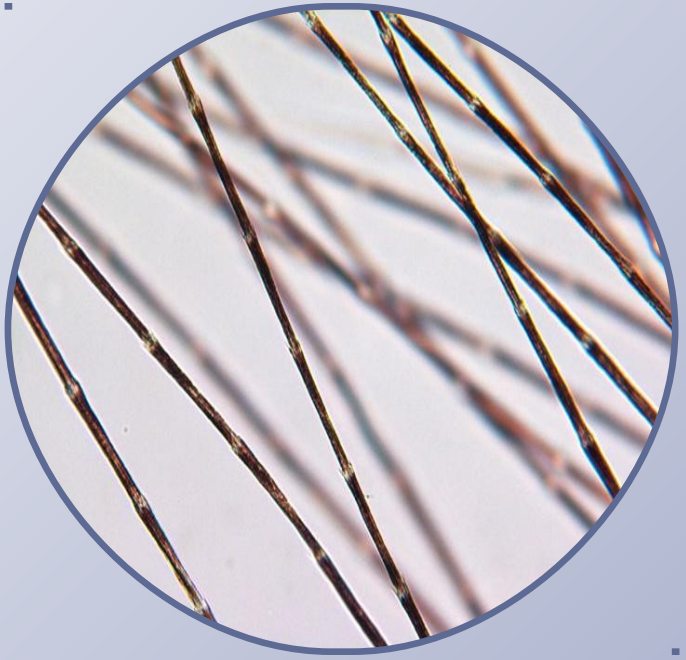
Altitude = 1,500’

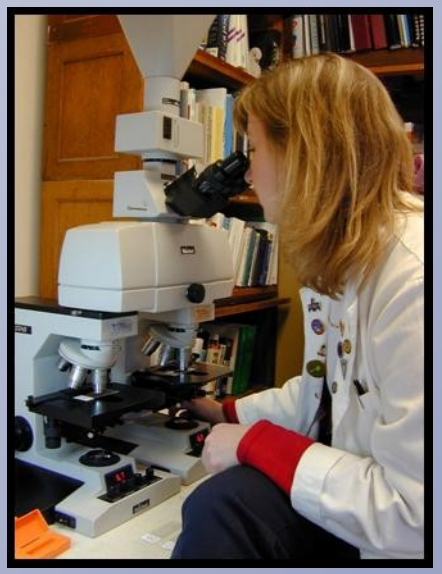
Impact point: wing

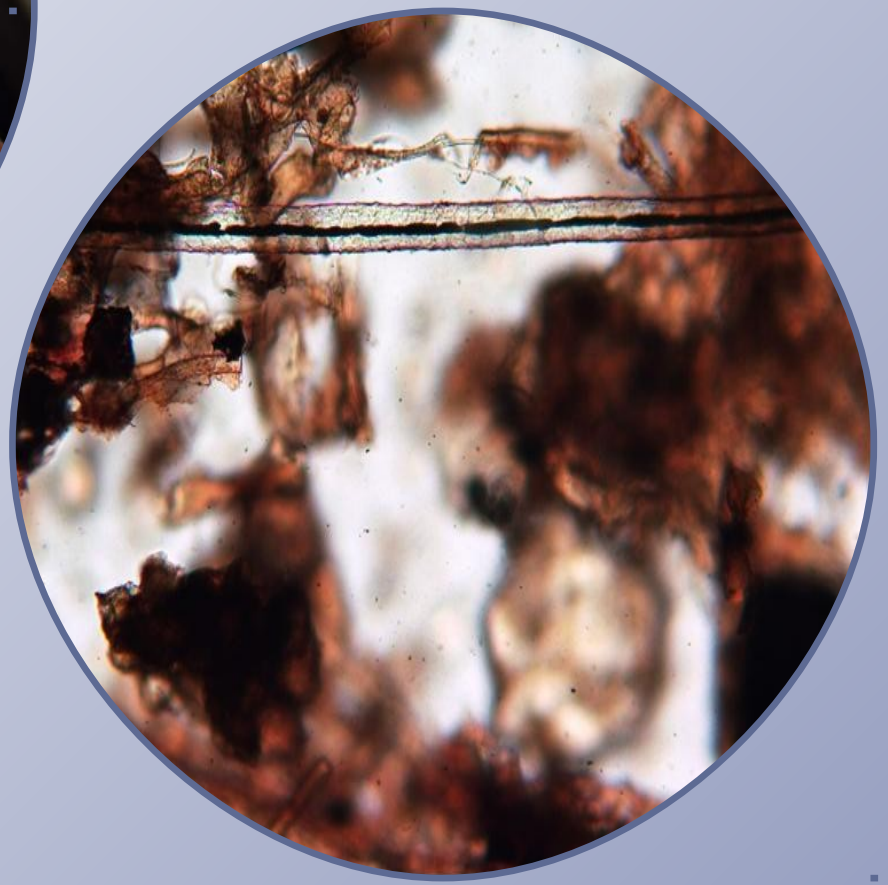


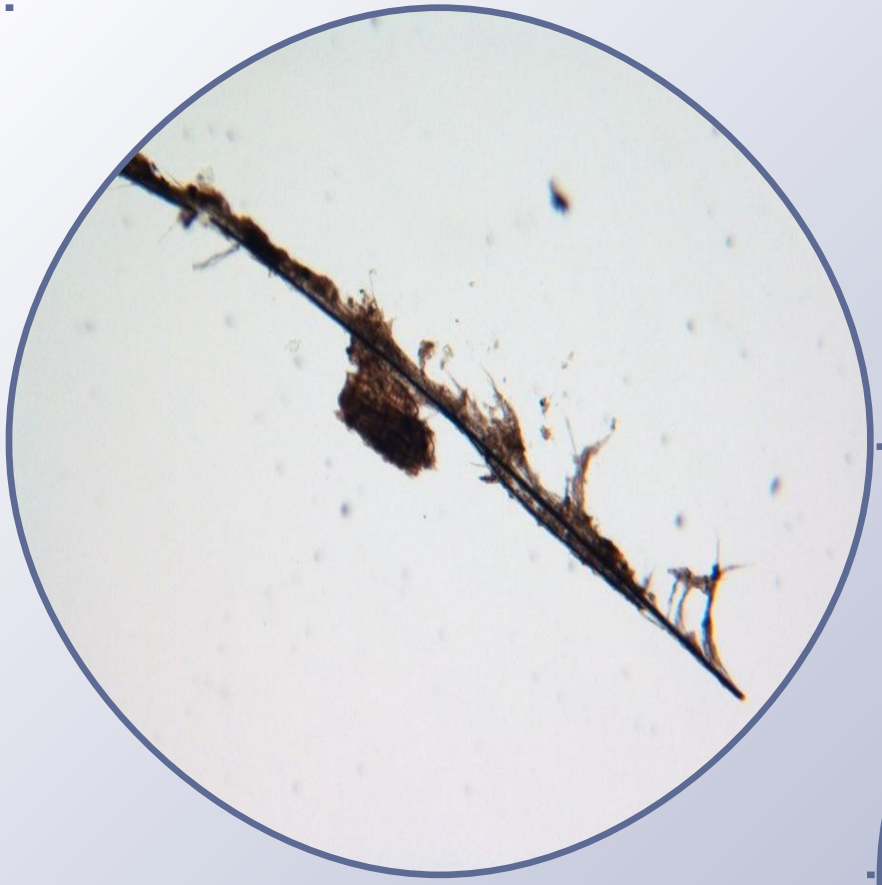
Microslide of unknown sample

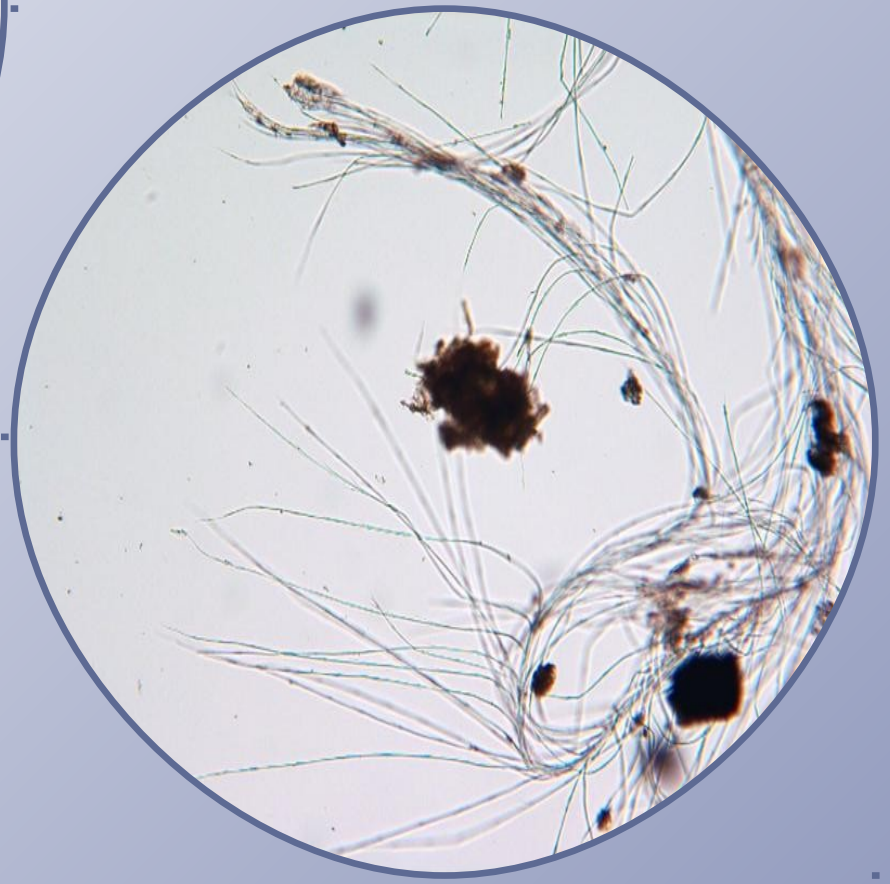


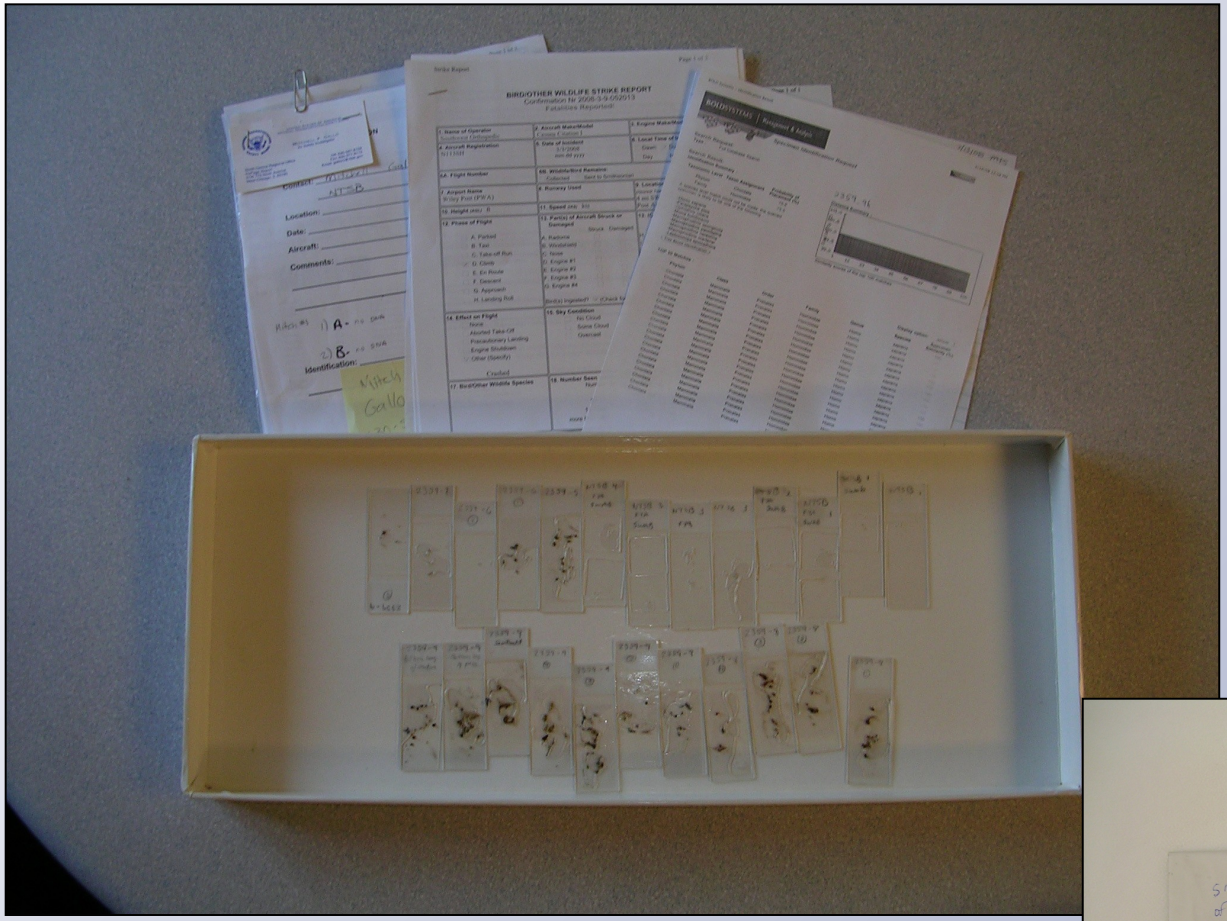


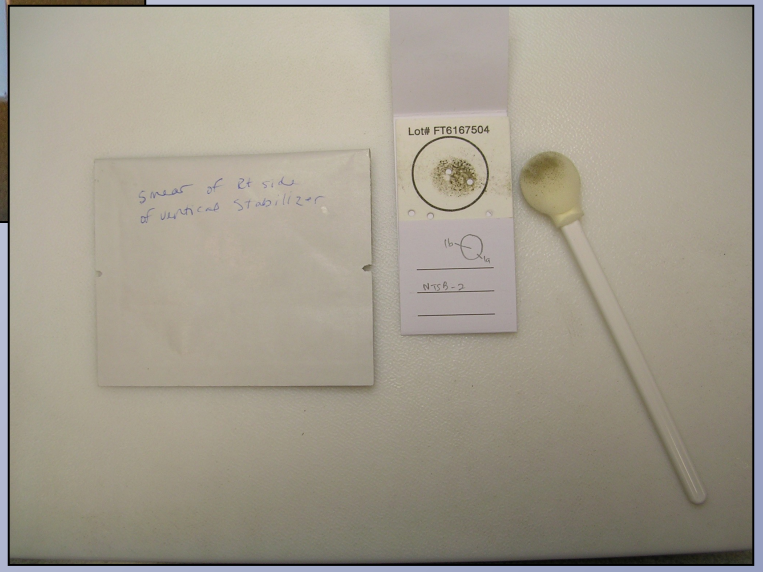


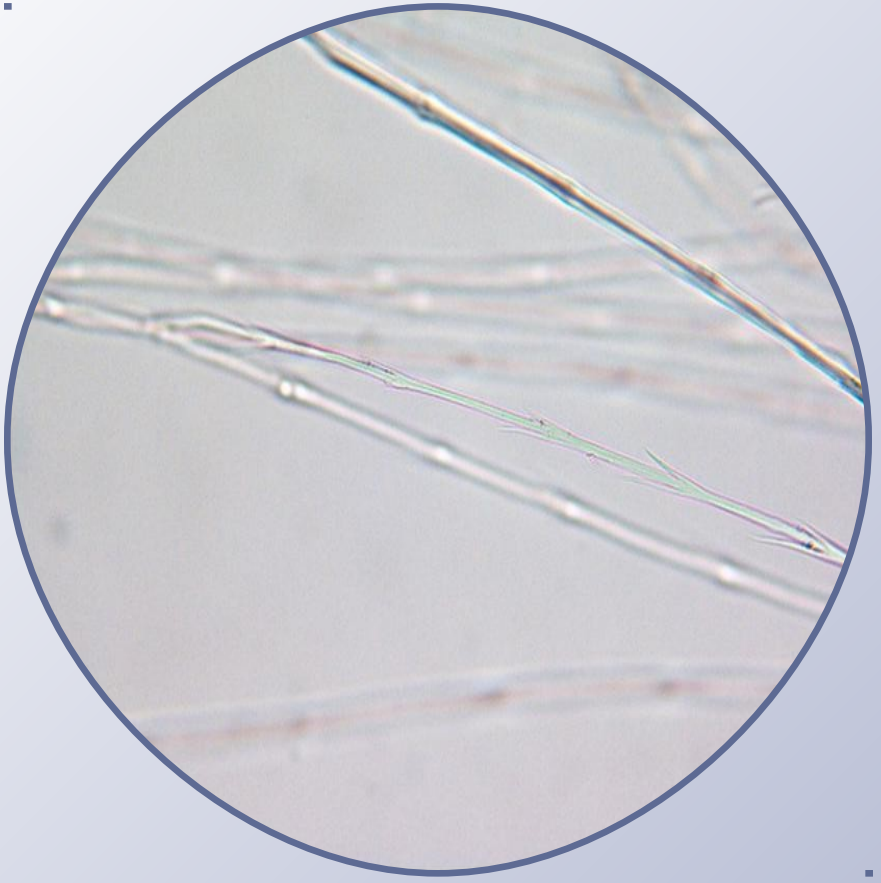




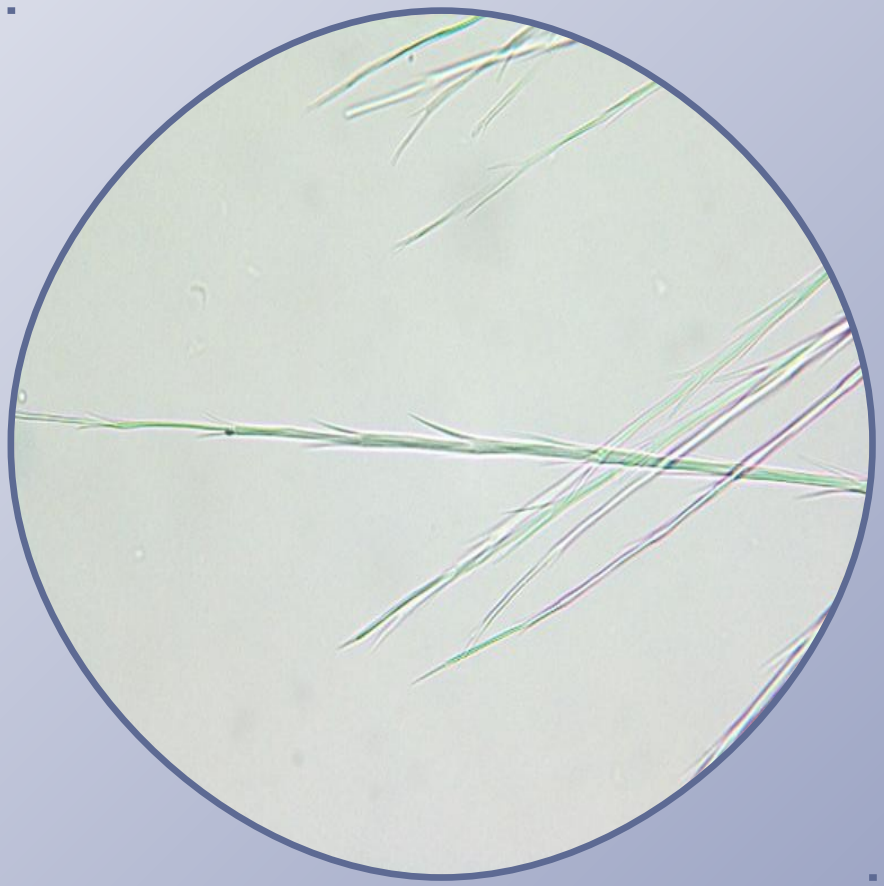



BIRD/OTHER WILDLIFE STRIKE REPORT
Location:
Date:
Aircraft:
Comments:
Identification:

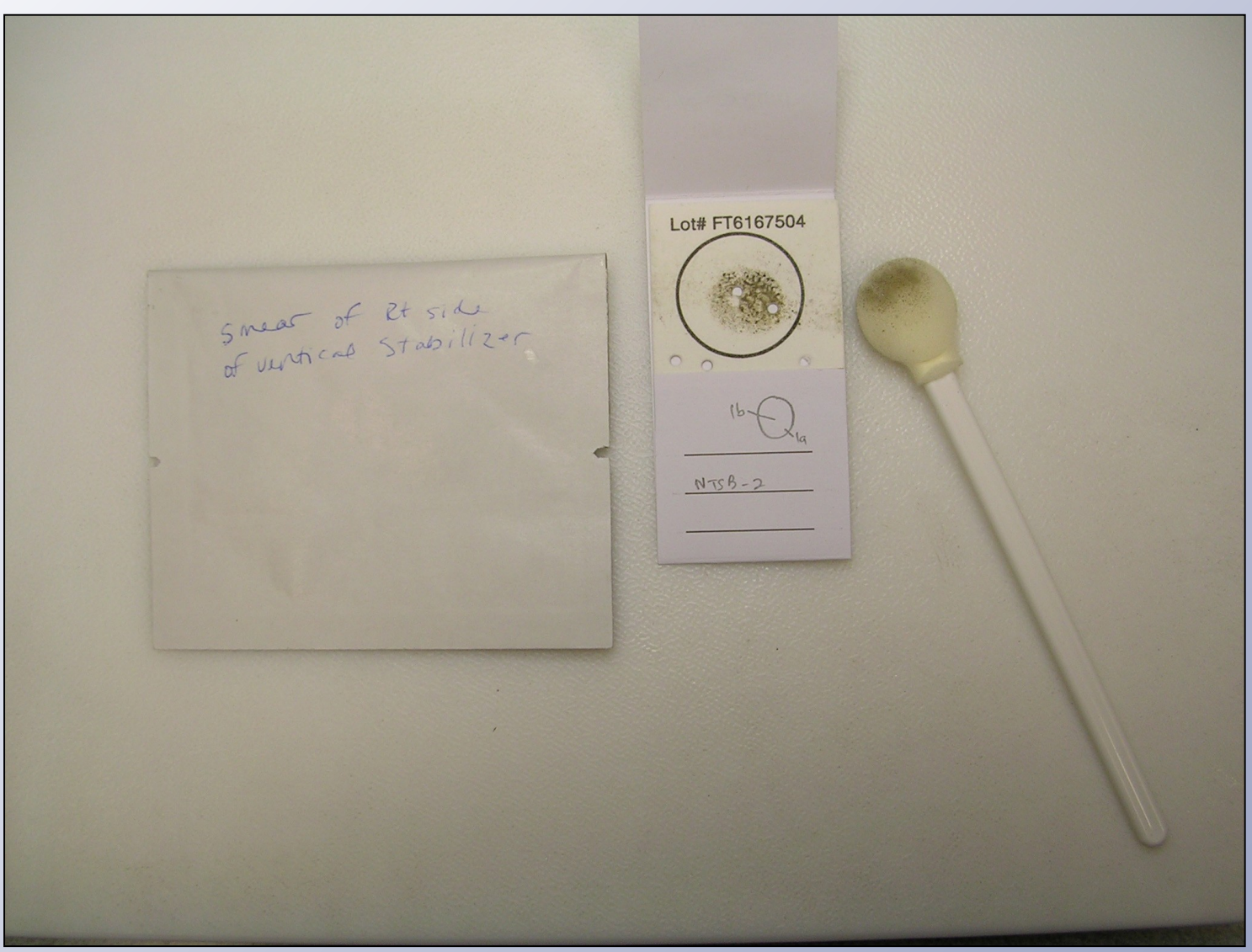

Lot# FT6167504
Smear of Rt side of Vertical Stabilizer
NTSB-2



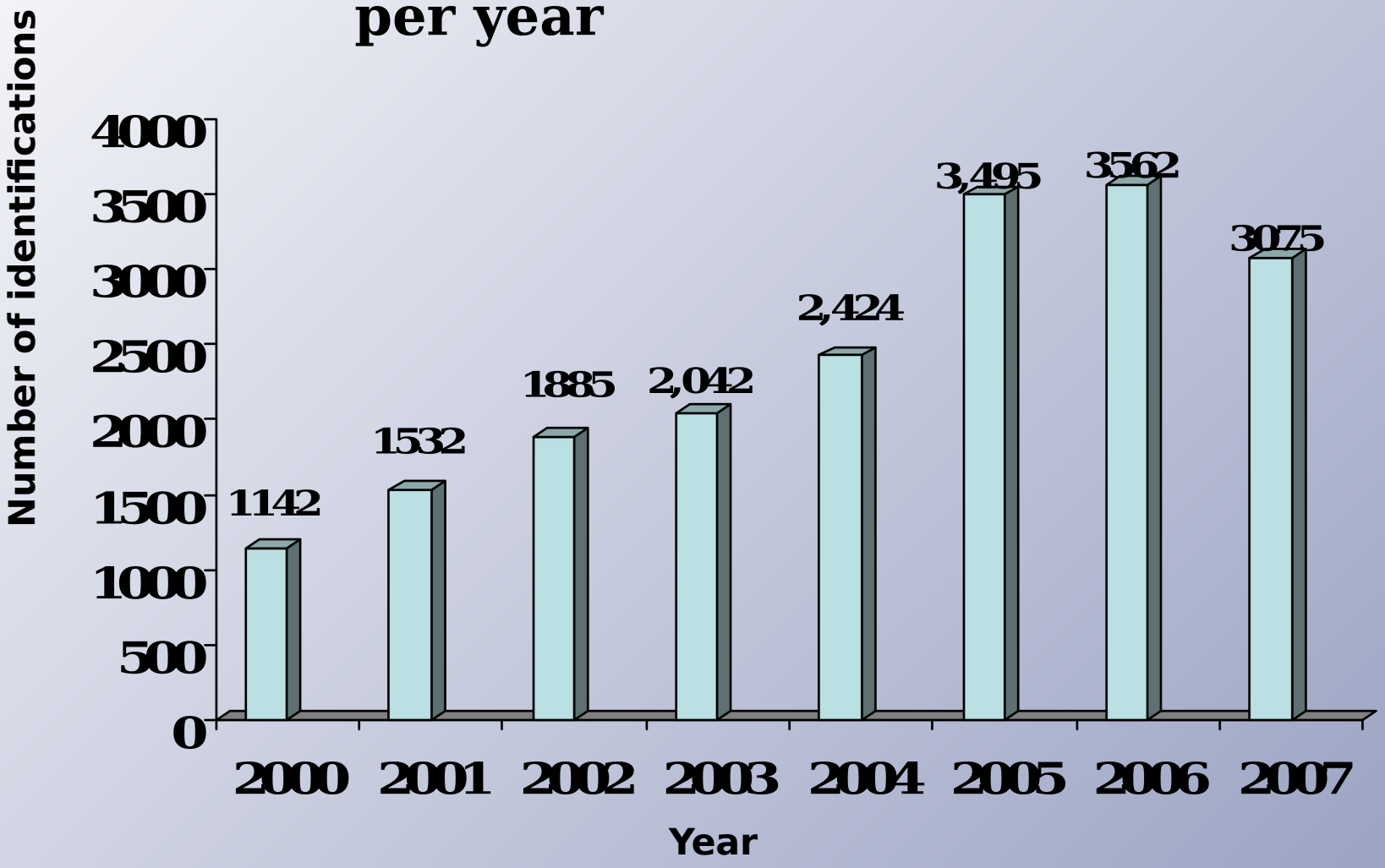
Unknown sample



Reference sample

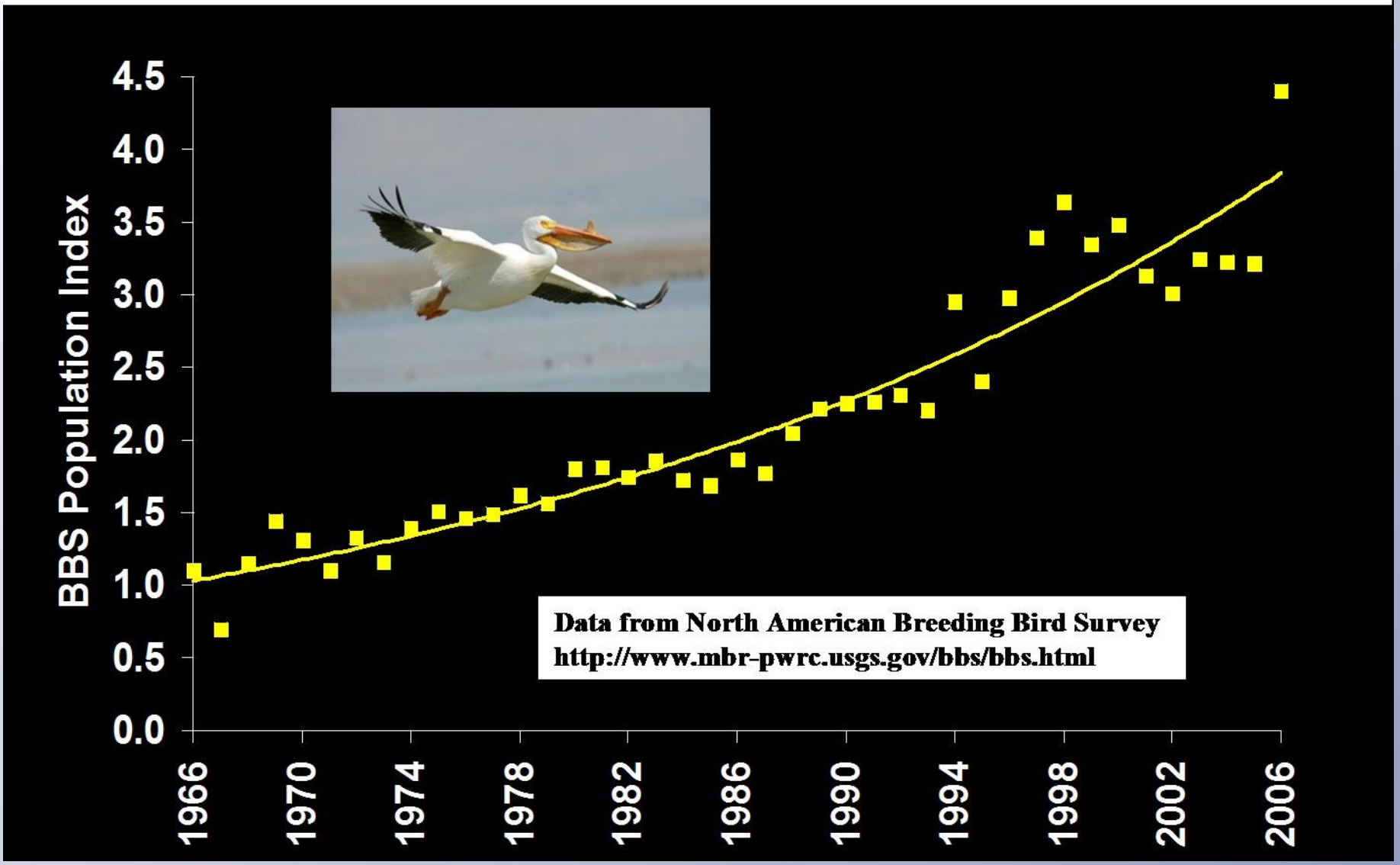

Smear of Rt side
of Vertical Stabilizer
Lot# FT6167504
1b
1a
NTSB-2

Number of USAF Identifications per year

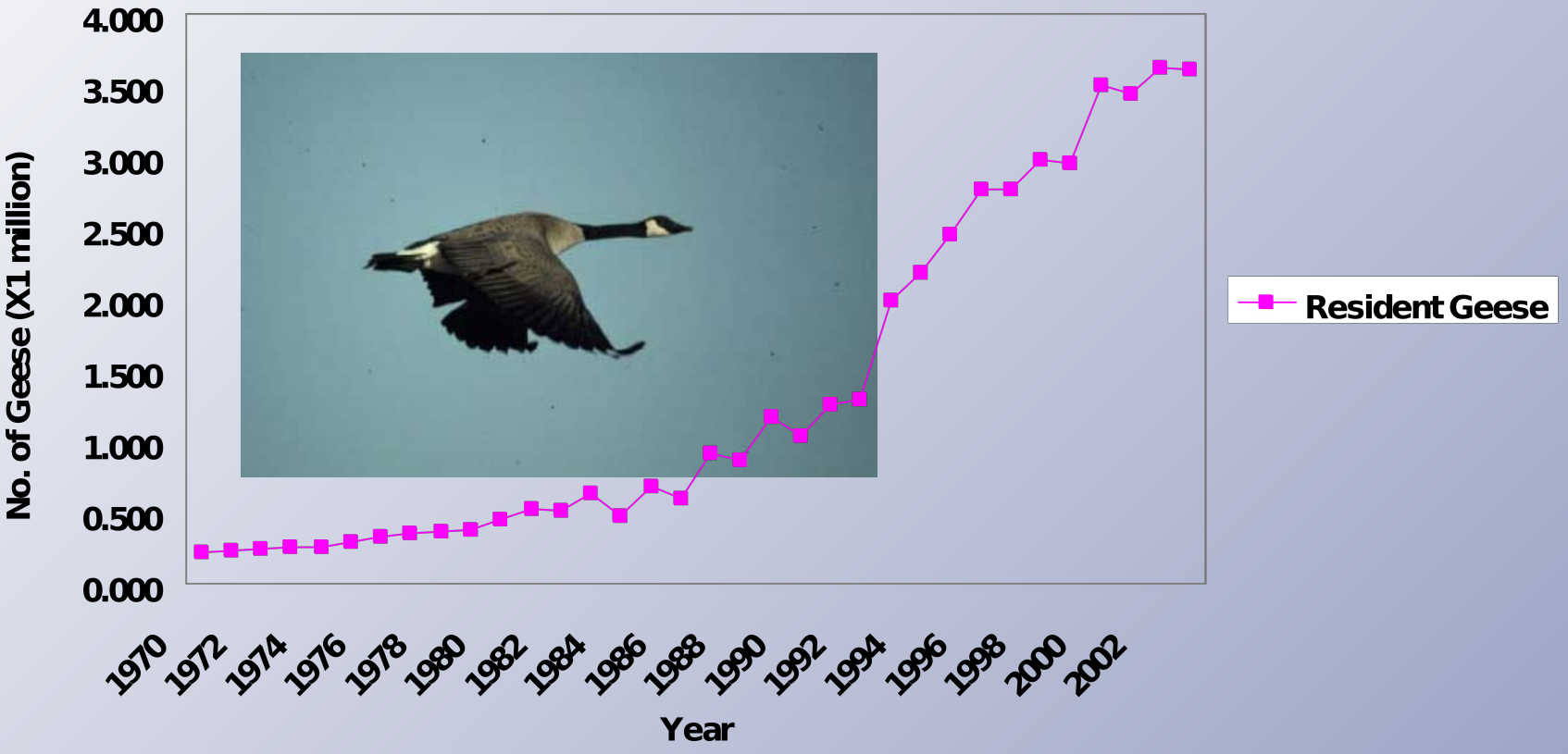


- 36 species of birds in North America exceed the 4 pound FAA weight standard established for airworthiness of airframes and windshields
- 13 of the 14 bird species in North America with mean body masses greater than 8 pounds have shown significant population increases over the past three decades

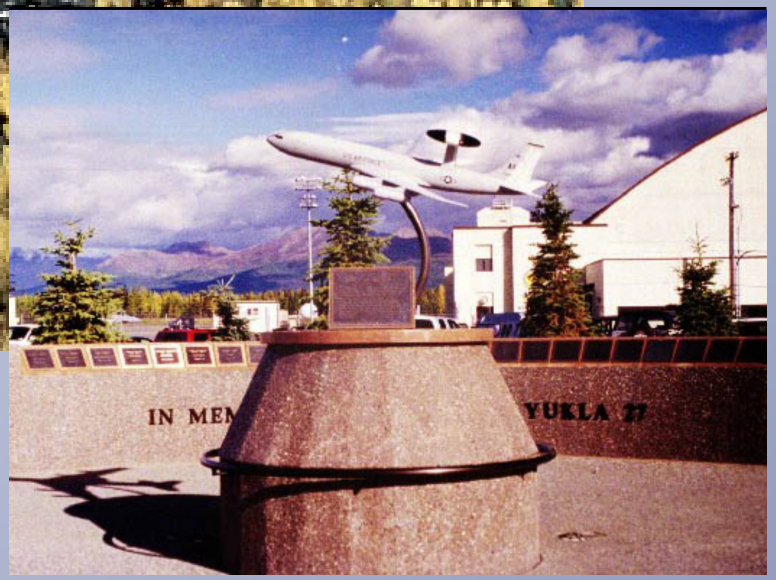
Breeding population of white pelicans has increased at a mean annual rate of 4.3% in North America, 1966-2006



RESIDENT (NON-MIGRATORY) CANADA GOOSE POPULATION IN NORTH AMERICA INCREASED FROM 1 MILLION IN 1990 TO 3.6 MILLION IN 2003

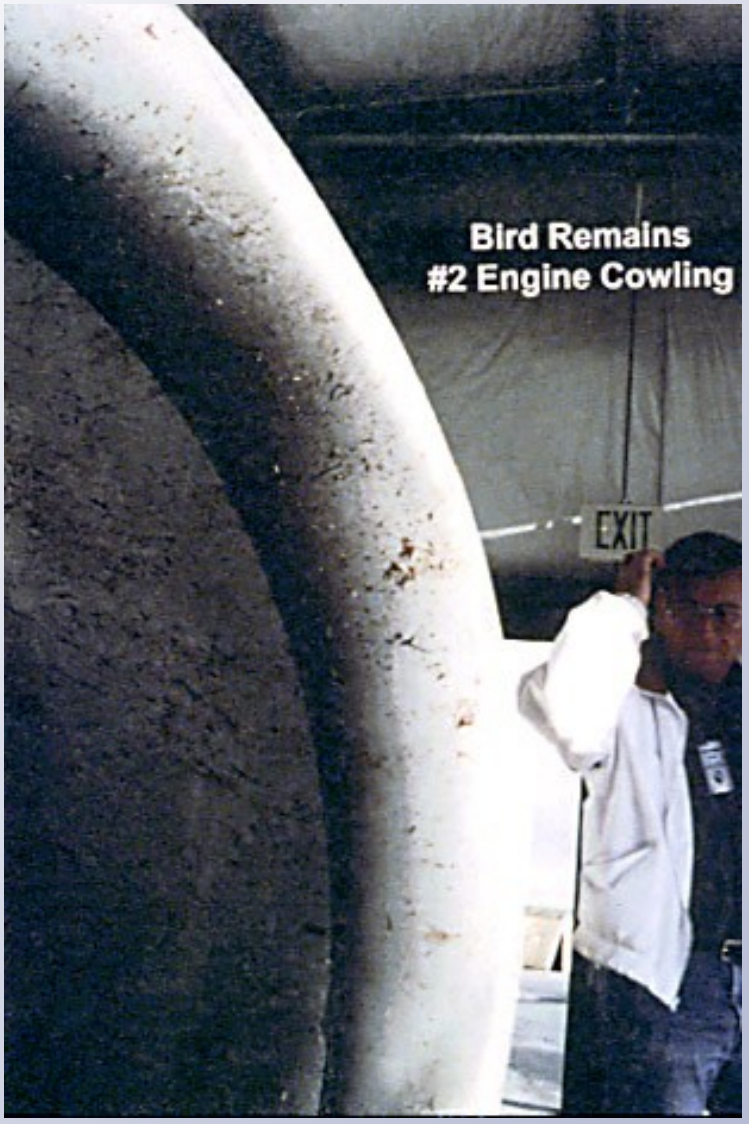


(Source U.S. Fish and Wildlife Service)



Elmendorf Air Force Base, Alaska
22 Sept 1995

USAF Canada Goose Strikes



	Count	Benchmarks
1993	12	
1994	7	
1995	5	24 strikes
1996	2	
1997	0	
1998	6	8 strikes
1999	4	
2000	5	
2001	6	
2002	2	
2003	1	
2004	2	
2005	2	
2006	3	33 strikes 1996-2006

Feather Lab Support:
•U.S. Air Force, HQ AFSC Bird Aircraft Strike Hazard Program

•U.S. Department of Transportation - Federal Aviation Administration- William J. Hughes Technical Center

•U.S. Air National Guard – Environmental Planning Branch

•U.S. Department of Defense (DoD) Legacy Resource Management Program

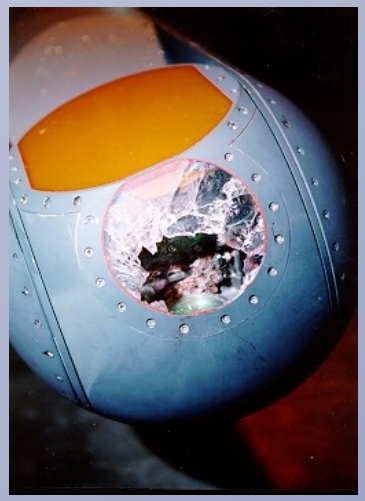
•Smithsonian Institution – LAB

•Special thanks to Capt. Laura Stepko, USAF Safety Center for assistance with statistical data for this presentation.

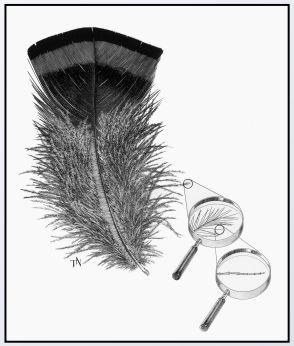
Benefits of species identification data:

- Development of bird-resistant aircraft windshields and engines based on weights of birds

- USAF F-16 cockpit redesigned to lower pilot's seating position to avoid injury from break-away debris
- Data used for USAF BAM (Bird Avoidance Model)
- Data used to justify construction of landfills away from airfields



- Habitat management plans implemented to discourage bird use on airfields
- Pest Management/bird control on airfields
- USFWS depredation permits
- Information on migration, habitat preference, diet, life history



Questions

dovec@si.edu
202-633-0787

Image courtesy USAF – Flying Safety Magazine